POSITION PAPER APRIL 2023

SMMT DRIVING THE MOTOR INDUSTRY

CHARGING AND REFUELLING REQUIREMENTS OF THE HEAVY GOODS VEHICLE SECTOR

EXECUTIVE SUMMARY

The UK government in its Transport Decarbonisation plan committed to ending the sale of all new, non-zero emission vehicles by 2040 at the very latest.[1] The end of sale of new, non-zero emission heavy goods vehicles (HGVs) has been announced for vehicles up to 26 tonnes in 2035 and for vehicles over 26 tonnes in 2040.

In March 2022, SMMT published its position paper[2] on charging and refuelling infrastructure requirements, focusing predominantly on cars and vans, however, the recommendations made in our seven-point plan also apply to the HGV sector. **This additional paper forms our position on what charging and refuelling requirements are needed for HGVs distributing freight along the strategic road network.**

1 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1009448/decarbonising-transport-a-better-greener-britain.pdf
2 https://www.smmt.co.uk/reports/electric-vehicle-infrastructure-position-paper/

RECOMMENDATIONS

Strategy

- Government should publish a heavy goods vehicle infrastructure strategy no later than Spring 2024.

Depot based charging

- Government should, through its review of the National Planning Policy Framework, simplify and create a nationally consistent process for installing charging and refuelling infrastructure at depots.
- A simplified nationally consistent process for connection to the grid to enable depot-based charging should be created.
- Support for depot charging, including energy provision and funding, should be provided as soon as possible.

Public charging

- An increase in investment to supplement Project Rapid should be provided now to ensure the charging and refuelling requirements of trucks (as well as buses and coaches) are also provided for.
- Government should conduct research in partnership with the freight sector to understand HGV movements and the volume of vehicles that are able to conduct their daily cycle without charge and those who will need to use a public charging network.
- Charging and refuelling solutions must support efficient operations to mitigate any additional costs that would otherwise be passed on to the consumer.

Collaboration

- A mechanism to allow effective collaboration between operators where depots are clustered together should be created to ensure sufficient energy is available for their fleet as they transition to zero emissions and also allow them to share charging facilities.
- Government must support cross sector opportunities for decarbonisation of transport, including road, rail and shipping.

TO DELIVER THESE RECOMMENDATIONS:

The government's Freight Energy Forum should deliver a long term infrastructure strategy to meet the commitment by the UK government to phase out the sale of new non-zero emission HGVs by 2035/40, in partnership with the automotive and logistics industries and other policy stakeholders. This should ensure UK-wide consistent policies at both local and national level.

HGV MARKET

Commercial vehicles are not purchased in the same way or for the same reasons as passenger cars. They are assets bought to carry out particular functions and services. The market for HGVs from 3.5T and over has remained steady for some years at an average of 52,770 per year between 2015 and 2019. The overwhelming majority of registrations are for diesel fuelled HGVs.[3] While there have been some early adopters, registrations of electric HGVs have only been seen very recently.

Zero emission HGVs are being introduced to the market and are available in the UK today, however, uptake remains low when compared with the bus, car and LCV markets. The HGV market is some 20 years behind that of the car[4] yet an end of sale date for HGVs up to 26 tonnes has been set at the same time as for cars and vans in 2035.

The availability of zero emission HGVs is growing with a variety of vehicles up to 44T available in the European market.[5] The UK market, while lagging behind Europe, is growing. As of March 2023, there are eight zero emission HGVs eligible for the Plug-in Truck Grant.

MODEL	WEIGHT	RANGE
FUSO eCanter	Up to 8.55T	Up to 200km
Paneltex Z75	Up to 26T	Up to 200km
Tevva T7 – T133	7.5T	Up to 500km
Electra e-Compact	Up to 32T	Up to 400km
Electra e-Star 27-350	Up to 44T	Up to 400km
DAF CF Electric Tractor Unit	37T	Up to 220km
Dennis Eagle E-Collect RCV	Up to 27T	Up to 300km
Renault Trucks D-Range	Up to 26T	Up to 400km

3 https://www.gov.uk/government/consultations/exemptions-to-2035-phase-out-date-for-the-sale-of-new-non-zero-emission-hgvs-26-tonnes-and-under/call-for-evidence-on-exemptions-to-the-2035-phase-out-date-for-the-sale-of-new-non-zero-emission-hgvs-26-tonnes-and-under#:~:text=Following%20consultation%2C%20government%20announced%20at,UK%20must%20be%20zero%20emission.
4 https://www.gov.uk/government/consultations/consulting-on-ending-the-sale-of-new-petrol-diesel-and-hybrid-cars-and-vans/outcome/ending-the-sale-of-new-petrol-diesel-and-hybrid-cars-and-vans-government-response
5 https://www.acea.auto/files/ACEA-position-paper-2022_HDV-CO2-Review.pdf

DEPOT CHARGING

Frequency of charging for a heavy goods vehicle will be dependent on its operation and will vary considerably with differing payloads and weather conditions. Research on how often HGVs need to charge is scarce due to the low operation of these vehicles in the real world.

Government should conduct research to understand the movement and volume of vehicles that are able to conduct their daily cycle with depot charging alone and those that will need to use the public charging network. This will help to determine a more accurate number of chargepoints required for use by HGVs. Furthermore, the number of foreign-registered HGVs also needs to be taken into account to ensure the cleanest vehicles can be used in the UK to achieve the greatest environmental improvements.

All operators using a battery electric HGV will need to have some level of charging capacity at their depot and individual operators and use cases will determine how much is needed dependent on their operation. The road logistics sector works on low margins and purchasing decisions are made against a total cost of ownership (TCO) model, **therefore, charging and refuelling solutions must support efficient operations to mitigate any additional costs that may be passed on to the consumer.** Charging and refuelling a zero-emission vehicle must be as easy as it currently is to refuel with diesel.

Battery electric trucks have so far been in operation in the UK for urban logistics and municipal services such as refuse collection, which are reliant on a depot-based charging solution for low mileage use cases. Depot charging will be required for all operators and should be facilitated as soon as possible. Many depots are not owned by the operator of the vehicles, which makes the upgrades for energy provision complicated and often restrictive. The current fleet of zero emission HGVs in the UK is very small and serves mainly urban transportation and refuse collection services. With the absence of public charging and hydrogen refuelling sites suitable for use by HGVs it is assumed that 100% of charging takes place at the depot.

In our EV Infrastructure Position Paper, SMMT called for a universal 'right to charge' in the same way that consumers have a right to connect in the modern internet age. This right should extend to commercial premises with landlords required to support the provision of infrastructure by granting the necessary consent.

The power requirements at the depot will be dependent on the number of vehicles and their actual use. Slow overnight charging can currently be undertaken with 22kW AC charging but it is expected that many operators will also benefit from 150kW+ charging capability to support a faster turnaround for the vehicle when necessary. Many tractor units will require at least a 40kW charge and therefore

charging provision must be future-proofed to consider the type of vehicles an operator is using in line with market development. The majority of depots in the UK have only one or two vehicles.

Operations that have consistent daily mileage and always return to base with low risk of detours or deviation to their operation such as urban distribution and refuse collection, for example, could operate without the need of any public charging or refuelling.

Locations of depots across the UK are widespread but do exist in clusters around major cities and ports. **The existing clustering of depots provides an opportunity for collaborations between operators to ensure sufficient energy is available for their fleet as they transition to zero emissions and also to allow them to share charging facilities where appropriate.**

Currently, there are considerable barriers to installing charging infrastructure at depots. In many cases the depot may not be owned by the operator and therefore they will require permission from the landlord. The cost of upgrading the local grid to provide sufficient power for vehicle charging is often a prohibitive factor. The current challenges should not be underestimated and government should act quickly to resolve these if net zero targets are to be met. To overcome these barriers, further regulatory support is required and **government should, through its review of the National Planning Policy Framework, simplify and create a nationally consistent process for installing charging and refuelling infrastructure at depots. Furthermore, a simplified, nationally consistent process for connection to the grid to enable depot-based charging should be created.**

The use of hydrogen for energy has been seen for a long time as one of the solutions to meeting net zero targets. Manufacturers are bringing hydrogen HGVs to the market both in the UK and across the world. The provision of a hydrogen refuelling station (HRS) at depots would allow operations to continue in the same way as they currently do with diesel. Many of the challenges faced by operators to install an HRS at the depot are much the same as that for electric vehicle charging.

The costs of installing hydrogen refuelling at a depot are significant and can extend to millions of pounds. **Considerable investment is needed to support this for the long haul freight sector in particular** where vehicles trave into Europe and Ireland. Many of these vehicles will be double shifted and only stop for their scheduled service, therefore, a battery electric solution will not yet be sufficient due to the long ranges driven without planned stopping for lengthy periods of time. The use of bunkered fuel locations for hydrogen refuelling may reduce some of the costs of installing infrastructure at depots and these can be shared by multiple operators.

PUBLIC CHARGING

The current public charging network for electric cars in the UK is not suitable for HGVs due to their differing technical specifications and higher power demand. Additionally, public charging has been designed to support the passenger car parc and therefore the parking spaces can rarely accommodate larger vehicles.

In 2021, the European Automobile Manufacturers' Association (ACEA) published its position paper on charging and refuelling infrastructure for HDVs.[6] It specified an installation target of 10,000-15,000 (higher-power) public and destination charging points by no later than 2025, and 40,000-50,000 charging points no later than 2030 in the EU27 countries plus the UK. The UK target is 2,450 chargepoints in 2025 and 8,200 chargepoints in 2030 at 3,000 locations. The location study acknowledges an over-representation of locations in the UK and does not take into account accessibility or suitability of the sites. **Further research is required to understand HGV movements across the UK and determine the number of public chargepoints required**. We can establish the number and type of locations that should be included in the charging and refuelling network and while this is lower than ACEA's estimate of 3,000, the number of chargepoints suggested is appropriate until further research can determine otherwise.

HGVs operate with diverse daily drive cycles and have different refuelling patterns to those of vans and passenger cars. They are also naturally larger and longer vehicles (especially when coupled to a trailer), meaning they need additional access and turning requirements only found in larger sites. HGVs do not always visit motorway services, with many common truck stops being A-road laybys, or on private land around business depots. This naturally limits the scope for recharging an electric truck when on regional or long-haul deliveries. A survey of truck parking conducted in 2021 by Aecom on behalf of DfT highlighted a shortage of parking spaces.7 The study focused on rest stops within 5km of the Strategic Road Network (SRN) and found a shortfall of 5,000 spaces. **This demonstrates that providing charging and refuelling infrastructure alone may not be enough and further support is required to improve parking provision for HGVs across the UK.**

SMMT welcomes UK Government's commitment of £950 million in its Rapid Charging Fund which seeks to provide energy for electric vehicle charging infrastructure at motorway service areas and along the SRN. However, this is currently focussed on car and van infrastructure. **An expansion of and an increase in investment to supplement Project Rapid should be provided now to ensure the**

[6] https://www.acea.auto/files/ACEA_Position_Paper-Heavy-duty_vehicles-Charging_and_refuelling_infrastructure.pdf
[7] https://www.gov.uk/government/publications/national-survey-of-lorry-parking-part-one-2022

charging and refuelling requirements of trucks (as well as buses and coaches) are also provided for.

From June 2021 to June 2022, 76% (90 million tonnes) of inter-modal journeys began or ended at a port.[8] UK ports remain key areas of HGV freight movement and should be considered part of any HGV charging strategy. There are 139 ports in the UK authorised for international and domestic movement of freight,[9] however, 10 major shipping ports in the UK account for around 68% of all cargo. These already have truck rest stops in close proximity so charging at the port itself will not be necessary.

Additionally, 23% (27 million tonnes) of inter-modal journeys began or ended at a railway siding. DfT's Freight Energy Forum has committed to the development of an HGV infrastructure strategy that looks at the whole freight sector. This is a welcome step and can create efficiencies through cross-sector working.

Providing battery electric charging on the SRN, truck rest stops and at or near ports and railway sidings will create a comprehensive network across the UK to support the decarbonisation of HGVs as well as coaches.

Due to the significant costs associated with the production and distribution of hydrogen, it is expected that the majority of hydrogen refuelling will take place at public or shared locations. The UK has gone backwards when it comes to actual deployment of hydrogen refuelling infrastructure, with fewer stations now than in 2019. There were 14, currently there are nine - seven for cars and two for buses.

The UK government must work with the automotive industry (including leasing and hire companies) and the logistics industry to create a detailed map of opportunity areas for hydrogen refuelling infrastructure, including priority and future options for private and public networks in the form of a hydrogen infrastructure strategy, with plans for installing and a view to graduated expansion over time.

[8] https://www.gov.uk/government/statistics/domestic-road-freight-statistics-july-2021-to-june-2022/domestic-road-freight-statistics-july-2021-to-june-2022
[9] https://www.gov.uk/government/statistical-data-sets/port-and-domestic-waterborne-freight-statistics-port

CONCLUSION

The challenges to decarbonise the HGV sector in such a short space of time must not be underestimated and for this reason it is imperative that government acts swiftly to convene collaboration between all stakeholders involved in the journey as well as providing support to secure the infrastructure and associated energy supply.

The current network of depots, MSAs and truck rest stops provide for an adequate spread of charging and refuelling opportunities. Further data is required to determine how much charging and refuelling capacity is required at each location.

LOCATION	NUMBER	MINIMUM REQUIREMENT
Depots	66,973	22kW to 500kW
Truck rest stops	329	50kW to 1MW
MSAs and TRSAs	114	350kW to 1MW and H2 350/700bar
Bunkered fuel sites	1000	H2 350/700 bar
Ports	139	350kW to 1MW

N.B. some truck rest stops are located at an MSA and should be counted as one location.

SMMT considers the hierarchy for HGV infrastructure to be as follows:

- Depot charging and refuelling
- MSAs/TRSAs
- Truck rest stops
- Intermodal locations (ports, railway sidings)

1: INTRODUCTION

The UK government in its Transport Decarbonisation Plan committed to ending the sale of all new, non-zero emission vehicles by 2040 at the very latest.[10] In November 2020, the UK Prime Minister announced government's decision to end the sale of new petrol and diesel cars and vans by 2030, and that all new cars and vans will be fully zero tailpipe emission from 2035.[11] The zero-emission car market has been growing for many years with 2021 being the most successful year in history for electric vehicle uptake when more new battery electric vehicles (BEVs) were registered than in the previous five years combined.[12] The following year, they became UK's second most popular powertrain with a market share of 16.6%.

Charging infrastructure for cars has been made available at home with the support of the Electric Vehicle Homecharge Scheme[13] and the On Street Residential Chargepoint Scheme[14] for drivers that do not have access to off-street parking, as well as the Workplace Charging Scheme.[15] This support, together with the plug-in car grant and benefit-in-kind incentives, has aided the plug-in car market to grow.

The end of sale of new, non-zero emission HGVs has been announced for vehicles up to 26 tonnes in 2035 and for vehicles over 26 tonnes in 2040. Emissions reduction from HGVs has been underway through advancing Euro standards and the use of alternative fuels which emit lower CO_2 when compared with the diesel equivalent. Alternative fuels provide an opportunity to reduce emissions from the existing diesel fleet while appropriate technology and infrastructure is developed to allow zero emission operation in all use cases.

In March 2022, the government published *Taking charge: the electric vehicle infrastructure strategy*,[16] which sets out its ambitions for charging infrastructure across the UK and the roles and responsibilities of stakeholders. The strategy focuses on the provision of charging infrastructure for cars and vans and does not set a position for the heavy-duty vehicle (HDV) sector. Also in March 2022, SMMT published its position paper on charging and refuelling infrastructure requirements mainly for cars and vans. [17] The recommendations made in our seven-point plan also apply to the HDV sector. **This additional**

[10] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1009448/decarbonising-transport-a-better-greener-britain.pdf
[11] https://www.gov.uk/government/consultations/consulting-on-ending-the-sale-of-new-petrol-diesel-and-hybrid-cars-and-vans/outcome/ending-the-sale-of-new-petrol-diesel-and-hybrid-cars-and-vans-government-response
[12] SMMT, December & Full Year 2021 New Car Registrations, available at: https://media.smmt.co.uk/december-2021-new-car-registrations/
[13] https://www.gov.uk/government/collections/government-grants-for-low-emission-vehicles#electric-vehicle-homecharge-scheme
[14] https://www.gov.uk/government/collections/government-grants-for-low-emission-vehicles#on-street-residential-chargepoint-scheme
[15] https://www.gov.uk/government/collections/government-grants-for-low-emission-vehicles#workplace-charging-scheme
[16] https://www.gov.uk/government/publications/uk-electric-vehicle-infrastructure-strategy
[17] https://www.smmt.co.uk/reports/electric-vehicle-infrastructure-position-paper/

paper forms our position on what charging and refuelling requirements are needed for HGVs distributing freight along the strategic road network.

RECOMMENDATIONS

Strategy

- Government should publish a heavy goods vehicle infrastructure strategy no later than Spring 2024.

Depot based charging

- Government should, through its review of the National Planning Policy Framework, simplify and create a nationally consistent process for installing charging and refuelling infrastructure at depots.
- A simplified nationally consistent process for connection to the grid to enable depot based charging should be created.
- Support for depot charging, including energy provision and funding, should be provided as soon as possible.

Public Charging

- An expansion of and an increase in investment to supplement Project Rapid should be provided now to ensure the charging and refuelling requirements of trucks (as well as buses and coaches) are also provided for.
- Government should conduct research in partnership with the freight sector to understand HGV movements and the volume of vehicles that are able to conduct their daily cycle without charge and those who will need to use a public charging network.
- Charging and refuelling solutions must support efficient operations to mitigate any additional costs that would otherwise be passed on to the consumer.

Collaboration

- A mechanism to allow effective collaboration between operators where depots are clustered together should be created to ensure sufficient energy is available for their fleet as they transition to zero emissions and also allow them to share charging facilities.
- Government must support cross-sector opportunities for decarbonisation of transport, including road, rail and shipping.

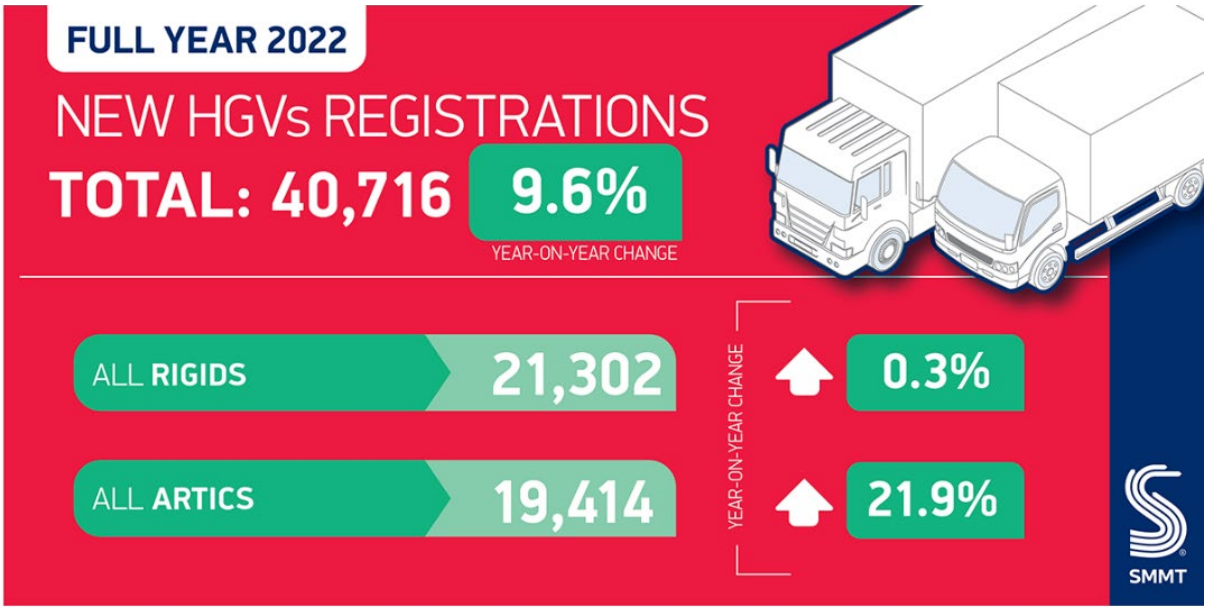
TO DELIVER THESE RECOMMENDATIONS:

The government's Freight Energy Forum should deliver a long term an infrastructure strategy to meet the commitment by the UK government to phase out the sale of new non-zero emission HGVs by 2035/40, in partnership with the automotive and logistics industries and other policy stakeholders. This should ensure UK-wide consistent policies at both local and national level.

2: HGV MARKET AND PARC

Commercial vehicles are not purchased in the same way or for the same reasons as passenger cars. They are assets bought to carry out particular functions and services. The market for HGVs from 3.5T and over has remained steady for some years at an average of 52,770 per year between 2015 and 2019.[18] A decline of 32.2%[19] was observed in 2020 as a result of the Covid pandemic, but 2022 saw growth in the market with units registered up to 40,000.[20] The volume of goods carried by the road freight sector has increased by 6% between 2009 and 2019.[21] Despite this increase, the number of HGVs on the road has remained consistent, demonstrating the increased efficiencies deployed in this sector.

FIGURE 1: HGV REGISTRATIONS 2022



The overwhelming majority of registrations are for diesel fuelled HGVs. While there have been some early adopters of electric HGVs, registrations of these vehicles have only been seen very recently. SMMT registrations data shows approximately two thirds of the HGV market to be under 26 tonnes and a Department for Transport call for evidence on the required exemptions to this end of sale date was

[18] https://www.gov.uk/government/consultations/exemptions-to-2035-phase-out-date-for-the-sale-of-new-non-zero-emission-hgvs-26-tonnes-and-under/call-for-evidence-on-exemptions-to-the-2035-phase-out-date-for-the-sale-of-new-non-zero-emission-hgvs-26-tonnes-and-under#:~:text=Following%20consultation%2C%20government%20announced%20at,UK%20must%20be%20zero%20emission.
[19] https://www.smmt.co.uk/2021/02/uk-hgv-registrations-fall-32-2-in-2020-as-operators-postpone-fleet-renewal/
[20] https://www.smmt.co.uk/2023/02/hgv-market-grows-as-bus-and-coach-registrations-fall/
[21] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/898747/domestic-road-freight-statistics-2019.pdf

held in 2022. [22] We await the results of this to determine which use cases will continue to operate with diesel after 2035. Government must act swiftly to provide clarity on their strategy for decarbonising the HGV sector to allow manufacturers to make investment decisions now to meet the 2035 and 2040 end of sale ambitions

The wide diversity and operating dynamics of vehicles within this sector means that no one technology currently offers the breakthrough necessary to remove the reliance on conventionally powered vehicles (ie no 'silver bullet'). The various use cases, including freight and logistics, construction, refuse collection and others will require specific solutions as their operation, charging requirements and average journey times will all differ. We expect there will remain some difficult to decarbonise use cases that will require a longer timeline for technology to develop sufficiently for their specific needs. This should, however, not distract from the sector of the market that can operate with zero emissions providing the appropriate enabling conditions are in place.

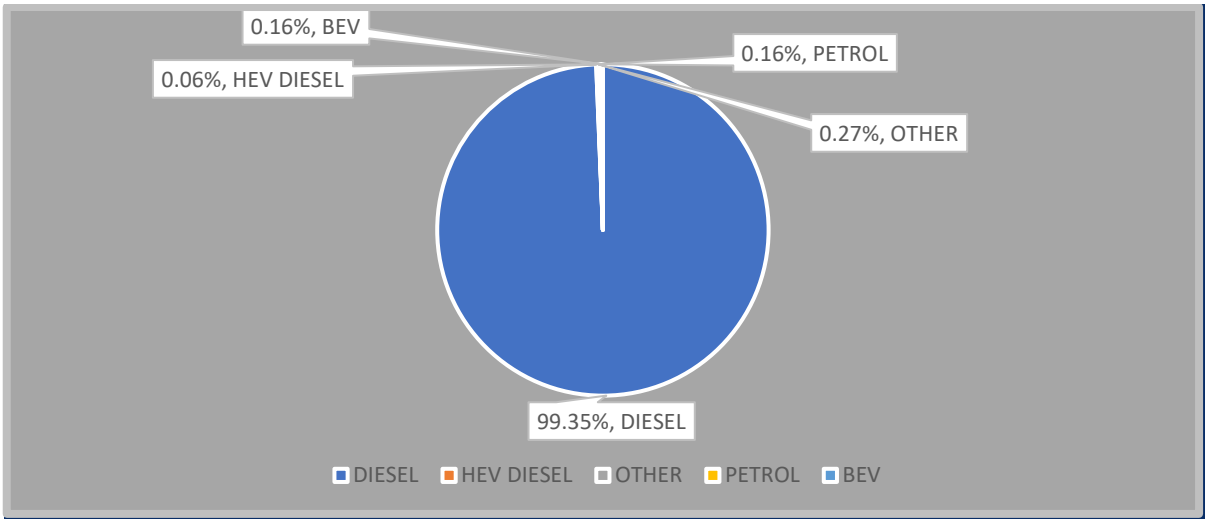
TABLE 1: HGV REGISTRATIONS BY WEIGHT

HGV	2019	2020	2021	2022
Under 26 T	38889	25770	26723	26743
26 T and Over	18341	13905	16428	18760
Total	57230	39675	43151	45503

The HGV parc consists of 615,570 vehicles ranging in size from 3.5 tonnes to 44 tonnes and up to 150 tonnes for vehicles authorised for use Special Types General Orders (STGO).[23] 99% of these are diesel fuelled. The remaining 1% are using alternative fuels with only 0.16% being full battery electric vehicles.

[22] https://www.gov.uk/government/consultations/exemptions-to-2035-phase-out-date-for-the-sale-of-new-non-zero-emission-hgvs-26-tonnes-and-under/call-for-evidence-on-exemptions-to-the-2035-phase-out-date-for-the-sale-of-new-non-zero-emission-hgvs-26-tonnes-and-under#:~:text=This%20call%20for%20evidence%20seeks,UK%20must%20be%20zero%20emission.
[23] SMMT data

FIGURE 2: HGV PARC BY POWERTRAIN 2022



Zero emission HGVs are being introduced to the market and are available in the UK today, however, uptake remains low when compared with the bus, car and LCV markets. The HGV market is some 20 years behind that of the car yet an end of sale date for HGVs up to 26 tonnes has been set at the same time as for cars and vans in 2035.[24]

Some examples of the use of low and zero emission HGVs can be seen within local authorities that have adopted the use of electric refuse collection vehicles (RCVs).[25] The technology is well suited for this use case because of the low-speed, back-to-base nature of their operations, which results in consistent low mileage on set routes and depot-based charging infrastructure. These examples represent a very small proportion of the HGV fleet and to meet government ambitions for decarbonisation the pace of uptake needs to be accelerated rapidly.

The Climate Change Committee (CCC) for its sixth carbon budget commissioned Element Energy to conduct some research on the costs, efficiencies and rollout trajectories for zero emission HGVs, buses and coaches.[26] Based on the evidence provided in the report, the CCC's Balanced Pathway assumes that the rollout of zero-emission HGVs accelerates to make up 96% by 2035 and nearly 100% by 2040.

The availability of zero emission HGVs is growing with a variety of vehicles up to 44T available in the European market.[27]

[24] https://www.smmt.co.uk/reports/fuelling-the-fleet-cv-report/
[25] https://news.cityoflondon.gov.uk/clean-air-city-corporation-to-become-first-uk-authority-to-run-fully-electric-refuse-truck-fleet/
[26] https://www.theccc.org.uk/publication/analysis-to-provide-costs-efficiencies-and-roll-out-trajectories-for-zero-emission-hgvs-buses-and-coaches-element-energy/
[27] https://www.acea.auto/files/ACEA-position-paper-2022_HDV-CO2-Review.pdf

TABLE 2: ZERO AND LOW EMISSION HGVS

		GVW (T)*	GTW (T)**	APPLICATION	RANGE (KM)***	AVAILABILITY
IVECO						
NIKOLA TRE	BEV	40t		General haulage	Up to 550km	2022
NIKOLA TRE	FCEV	40t		General haulage	>800km	2023
DAF						
LF ELECTRIC	BEV	19t		Urban/national distribution	240-270km	Series production
CF ELECTRIC	BEV	20t	37t	Urban/ national distribution	200-230km	Series production
CF ELECTRIC	BEV	29t	37t	Urban / national distribution	200-230km	Series production
CF HYBRID	HEV	20t	40t	National distribution	50km electric	Field trial
XF HYDROGEN	ICE H2	20t	44t	National distribution / long haul	600-800km	Prototype
DAIMLER TRUCK						
ECANTER	BEV	7.49t		Urban delivery	100km	Series production since 2017
EACTROS 300	BEV	19-27t	40t	Regional delivery	300km	Series production since 2021
EACTROS 400	BEV	27t		Regional delivery	400km	Series production since 2021
EECONIC 300	BEV	27t		Municipality / urban delivery	100-150km	2022
EACTROS LONG HAUL	BEV		40t	Regional delivery / long haul	500km	Series announced for 2024
GENH2	FCEV		40t	Long haul	Up to 1,000km	Series announced for 2027
HYUNDAI						
XCIENT FC	FCEV	19.5t	36t	Distribution /urban delivery / national & regional	Approx 400km	Production since 2020
XCIENT FC	FCEV	27t	42t	Distribution /urban delivery / national & regional	Approx 400km	Production since 2022
MAN						
ETGM	BEV	26t		Distribution	Up to 180km	Short series
ETRUCK	BEV	tbd	tbd	Distribution	tbd	Series production announced for 2024
BAYERNFLOTTE	FCEV	tbd	tbd	Long haul	tbd	Customer demo fleet 2024
		GVW (T)*	**GTW (T)****	**APPLICATION**	**RANGE (KM)*****	**AVAILABILITY**
SCANIA						
	HEV		36t	Long haul / distribution	15km	Series production

	PHEV		36t	Distribution	60km	Series production
25L OR 25P	BEV	19t		Distribution	100km	Series production
25L OR 25P	BEV		29t	Distribution	250km	Series production
R- OR S-	BEV	29t	64t	Regional	Up to 420km	Sales start 2022
	BEV	29t	64t	Distribution/regional /long haul / construction	Up to 490km	Series production 2024
VOLVO TRUCKS						
FH ELECTRIC	BEV		44t	Regional	300km	Sales start 2021
FM ELECTRIC	BEV		44t	Regional	380km	Sales start 2021
FMX ELECTRIC	BEV		44t	Construction	320km	Sales start 2021
FE ELECTRIC	BEV	27t		Distribution	200km	Sales start 2019
FL ELECTRIC	BEV	17t		Distribution	300km	Sales start 2019
RENAULT TRUCKS						
MASTER ZE	BEV	3.5t		Distribution	Up to 120km	Series production
D ZE	BEV	16t		Distribution	Up to 400km	Series production
D WIDE ZE	BEV	20t & 27t		Distribution & city construction	Up to 200km	Series production
T ELECTRIC	BEV		44t	Regional	300km	Production start Q4 2023

* Gross vehicle weight (in tonnes)
** Gross train weight (in tonnes)
*** Currently, there is no official methodology for determining the range of alternatively-powered vehicles. Figures are based on manufacturers' individual assessments.

SOURCE: ACEA POSITION PAPER 2022 HDV CO2 REVIEW28

These vehicles can be brought to the UK market if the appropriate enabling conditions are in place, including sufficient incentives for operators to purchase vehicles as well as support for infrastructure. The UK market, while lagging behind Europe, is growing. As of March 2023, there are eight zero emission HGVs eligible for the Plug-in Truck Grant.

[28] ACEA position paper 2022 HDV CO_2 review

TABLE 3: HGVS ELIGIBLE FOR THE PLUG IN TRUCK GRANT, MARCH 2023

MODEL	WEIGHT	RANGE
FUSO eCanter	Up to 8.55T	Up to 200km
Paneltex Z75	Up to 26T	Up to 200km
Tevva T7 – T133	7.5T	Up to 500km
Electra e-Compact	Up to 32T	Up to 400km
Electra e-Star 27-350	Up to 44T	Up to 400km
DAF CF Electric Tractor Unit	37T	Up to 220km
Dennis Eagle E-Collect RCV	Up to 27T	Up to 300km
Renault Trucks D-Range	Up to 26T	Up to 400km

In 2021, BEV HGVs accounted for just 0.3% of global sales, with China being the country where the highest deployment is observed[29] compared with 9% in the global car market.[30] The UK position reflects the world picture but has the most globally ambitious target for the end of sale.[31] For UK climate change commitments to be upheld, the required expansion of the zero emission HGV market is dependent on the vital provision of charging and refuelling infrastructure to support operations in all use cases.

[29] https://iea.blob.core.windows.net/assets/ad8fb04c-4f75-42fc-973a-6e54c8a4449a/GlobalElectricVehicleOutlook2022.pdf
[30] https://iea.blob.core.windows.net/assets/ad8fb04c-4f75-42fc-973a-6e54c8a4449a/GlobalElectricVehicleOutlook2022.pdf
[31] https://www.gov.uk/government/consultations/heavy-goods-vehicles-ending-the-sale-of-new-non-zero-emission-models/outcome/outcome-and-response-to-the-consultation-on-when-to-phase-out-the-sale-of-new-non-zero-emission-hgvs

3: HGV FREIGHT OPERATIONS

The HGV sector operates in a distinctly different way to that of the passenger car and light commercial vehicle (LCV) markets so it cannot be assumed that the current charging strategies set out will apply in the same way. Within the HGV sector itself there remains diversity of use cases between HGVs used for freight or for servicing. Freight functions are then also split by urban, regional and long haul operations.

Long haul operations will include vehicles travelling to Europe and Ireland, therefore interoperability of charging and refuelling solutions is key. Due to the long-distance nature of the services they provide, drivers will be required to stop overnight at rest stops or the destination. For these operations to continue with the efficiencies they require to remain commercially viable, we must not have differing technologies with neighbouring countries but ensure alignment to allow the smooth movement of essential goods for UK consumers.

Regional operations may start at a base location and operate between major distribution centres. Drivers will need to rest after four and a half hours and then rest overnight after nine hours. The specific case will determine whether the driver is able to return to the depot at the end of the shift.

Urban distribution services also include vans but an HGV would be used for larger shipments and consolidated loads. Many cities have deployed last mile logistics initiatives that are able to be carried out by smaller vehicles including electric vans and cargo bikes, however, for a low number of drops, using an HGV may be more efficient and contribute less to local congestion.

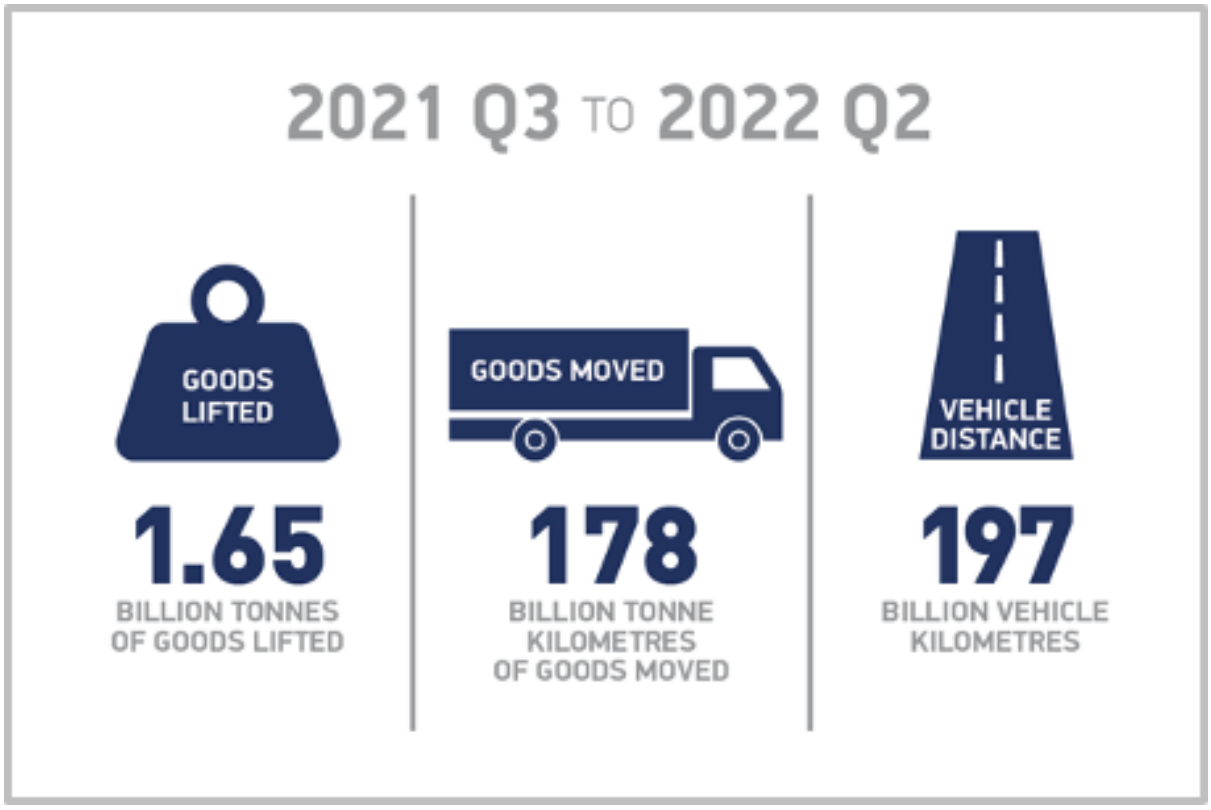
The destination for an HGV will vary depending on the type of operation being carried out. A long haul destination might be the port, railway siding or distribution centre. Regional and urban operation destinations are likely to be a distribution centre or the end customer.

According to the road freight statistics compiled by the Department for Transport (DfT), in the 12 months from June 2021 to June 2022, 1.65 billion tonnes of goods were lifted in the UK with 19.7 billion vehicle kilometres travelled.[32] This is an increase of 8% which shows HGV traffic is now higher than pre-pandemic levels. DfT also report the transport sector as being the highest emitter of CO_2 in 2021 with one fifth of these emissions being from HGVs.

[32] https://www.gov.uk/government/statistics/domestic-road-freight-statistics-july-2021-to-june-2022/domestic-road-freight-statistics-july-2021-to-june-2022

TABLE 4:

TOTAL AMOUNT OF DOMESTIC GOODS LIFTED, GOODS MOVED, AND VEHICLE KILOMETRES TRAVELLED BY GB-REGISTERED HGVS

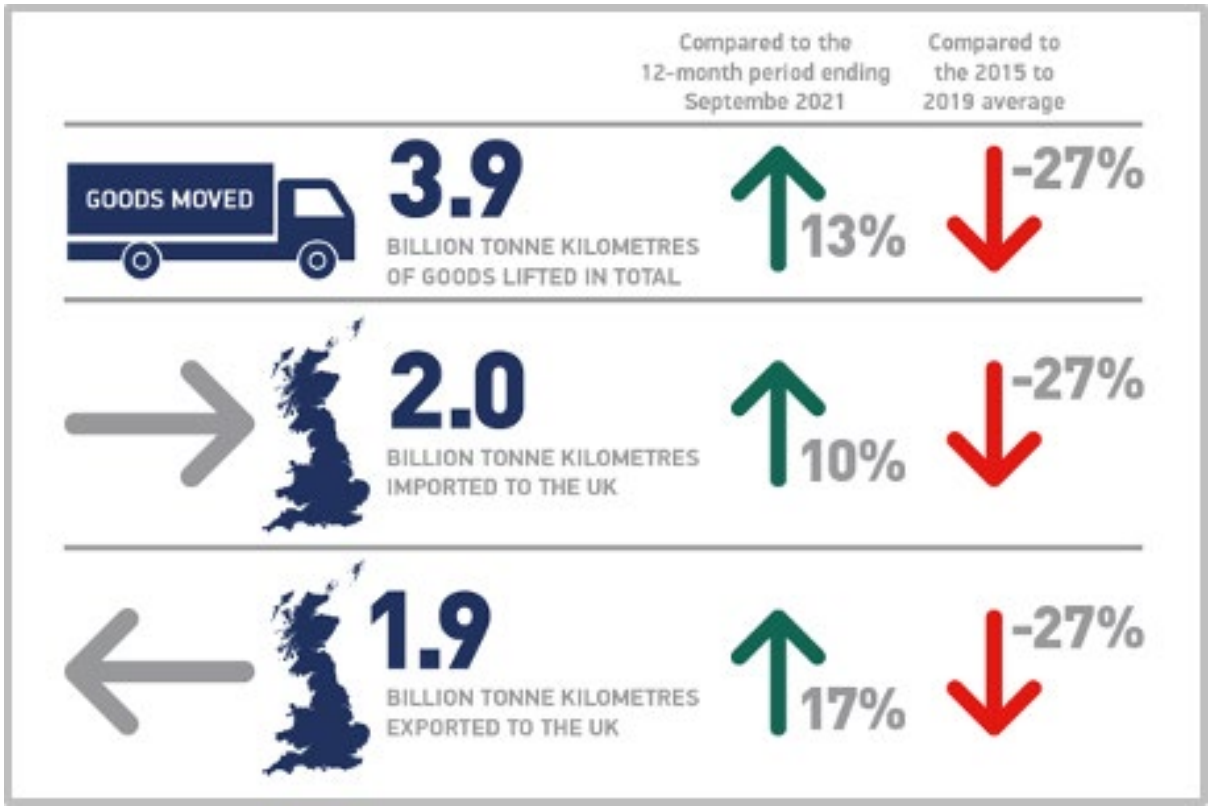


Source: DfT

From October 2021 to September 2022, 6.3 million tonnes of goods were lifted internationally by UK registered HGVs. 3.3 million tonnes were goods imported into the UK while the remaining 3 million tonnes were exported overseas.[33]

[33] https://www.gov.uk/government/statistics/road-freight-statistics-october-2021-to-september-2022/international-road-freight-statistics-october-2021-to-september-2022#:~:text=(%20Quarter%203%20).,UK%20%2Dregistered%20HGVs%20transporting%20freight%20internationally%20in%20the%2012%2Dmonth,2015%20to%202019%20(5.3%20billion

TABLE 5:TOTAL AMOUNT OF GOODS MOVED INTERNATIONALLY BY UK-REGISTERED HGVS



Source: DfT

A large proportion of HGV-distributed freight in the UK involves an intermodal element. The dominant mode being shipping with 76% of journeys in 2021 beginning or ending at a port, 23% of journeys beginning or ending at a rail siding terminal and just 3% at an airport.

The number of vehicles used for freight activity as well as the number of depots in the UK is derived from data provided by the Traffic Commissioner. Under The Goods Vehicles (Licensing of Operators) Act 1995 it is a requirement for all operating licence holders to have an operating centre (depot); this is where a vehicle will be kept when it is not in use.[34] The Traffic Commissioner reported in September 2022 there were 66,973 heavy goods vehicle operating centres across the eight traffic areas. Of these, 7,733 do not have any vehicles specified at the time of reporting. An overview of the number of centres and vehicles in each area is detailed below.

[34] https://www.legislation.gov.uk/ukpga/1995/23/contents

TABLE 6: GOODS VEHICLE OPERATING CENTRES OVERVIEW

TRAFFIC AREA	NUMBER OF VEHICLES	NUMBER OF OPERATING CENTRES
East of England	73406	12416
London and the SE	41640	7714
North East of England	58832	10119
North West of England	51826	9135
Scotland	31755	5447
Wales	19865	4584
West Midlands	40920	7676
West of England	53435	9882
TOTAL	371679	66973

FIGURE 3: TRAFFIC AREAS

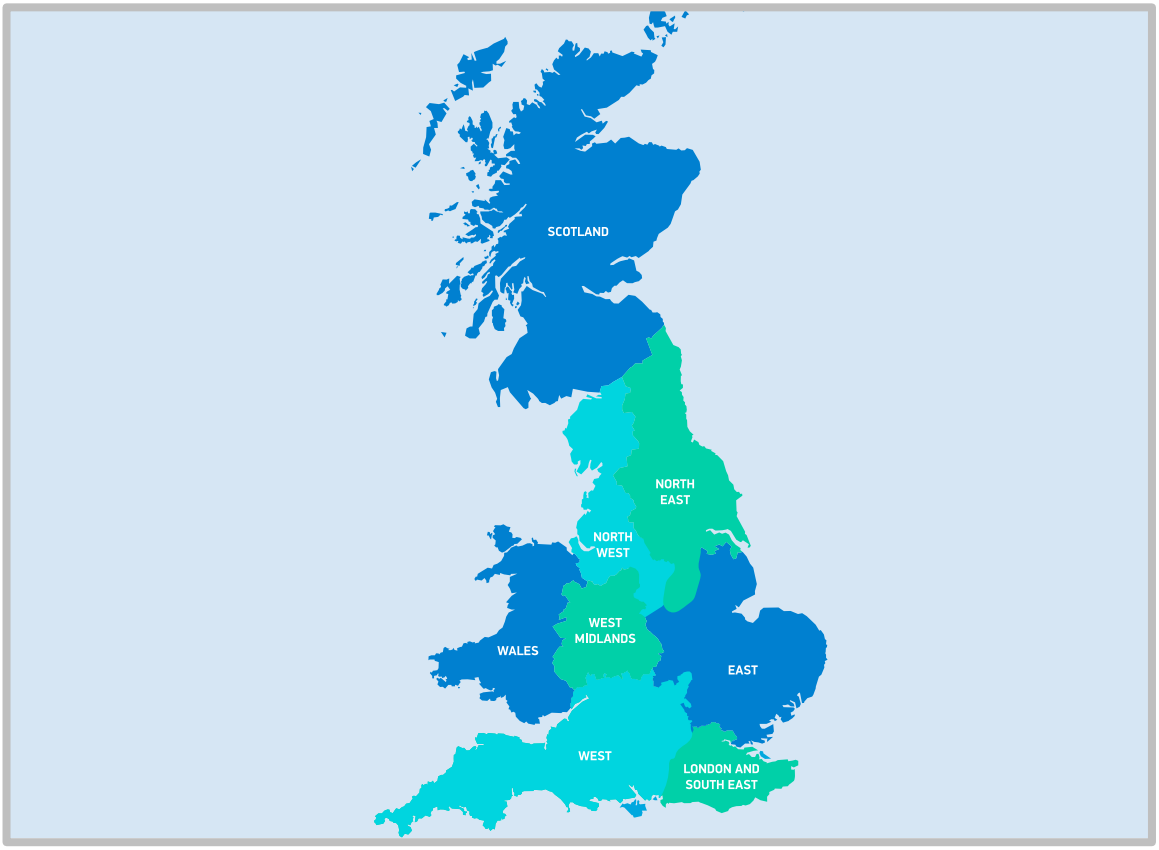


FIGURE 6: GOODS VEHICLE OPERATING CENTRES OVERVIEW

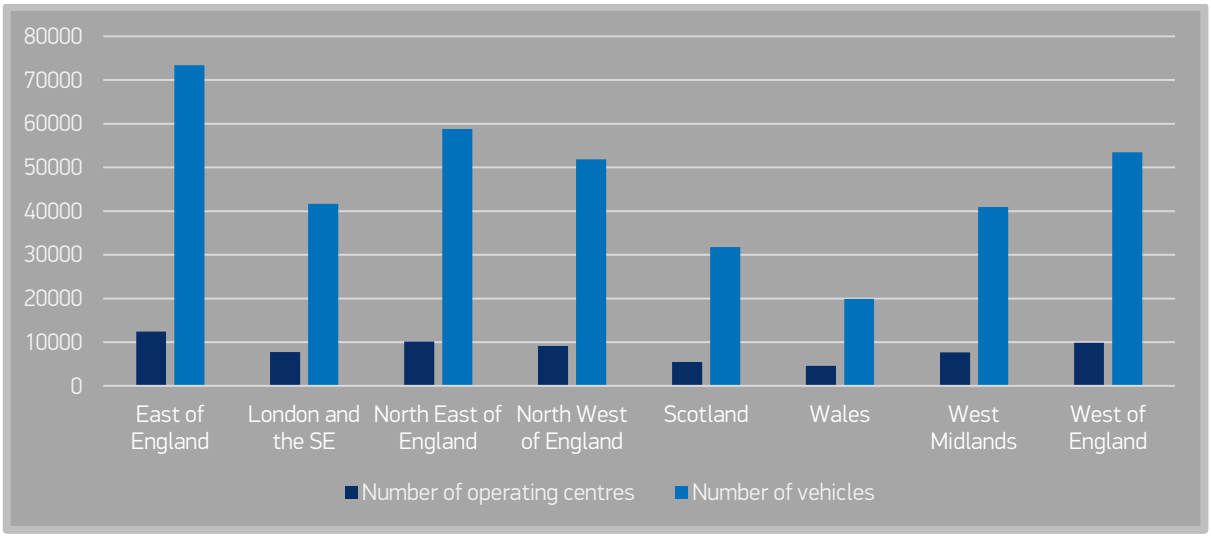
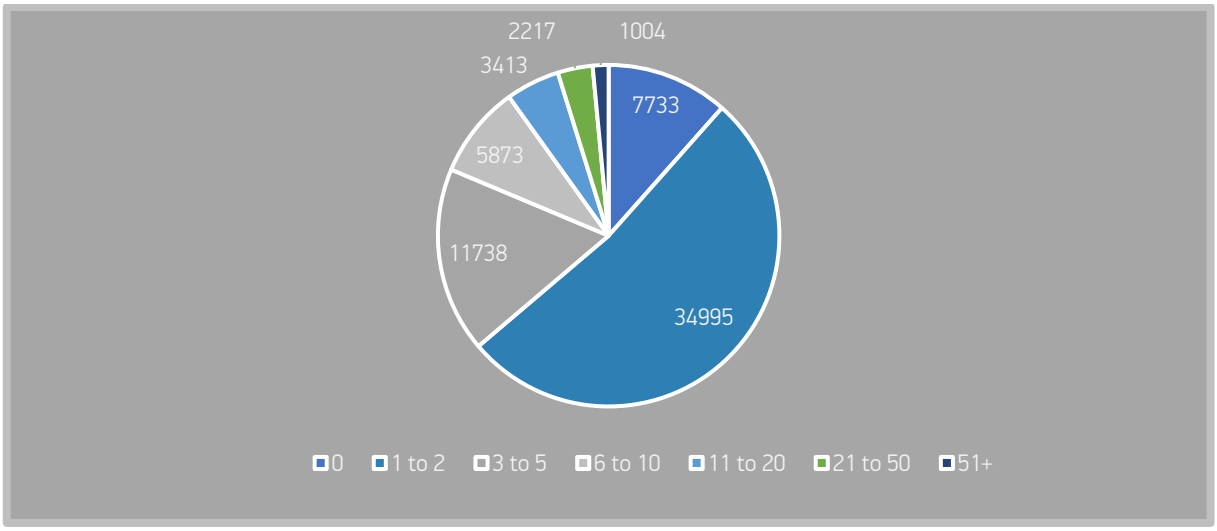


FIGURE 7: OPERATING CENTRES (DEPOT) BASED ON THE NUMBER OF VEHICLES SPECIFIED



HGVs are proportionally the highest CO_2 emitter within the road transport sector and with more than half of the HGV fleet operating fewer than 10 vehicles, support must be provided to allow these vehicles to operate with zero emissions. Many of these operators will be SMEs and may not therefore have access to the benefits that a larger multinational corporation may have in terms of a dedicated budget and commitment to decarbonisation.

4: HGV CHARGING AND REFUELLING REQUIREMENTS

Decarbonising the HGV sector remains a significant challenge and the provision of charging and refuelling infrastructure is vital to overcoming the barriers for fleet operators so that we can achieve the government's net zero obligations and the end of sale ambitions in 2035/40.

The former Department for Business Energy and Industrial Strategy (BEIS), through the Digest of UK Energy Statistics, reports approximately 6 million tonnes of diesel is used for HGVs each year (2.3 million for rigid and 3.7 million for articulated vehicles).[35]

HGVs currently re-fuel mainly at the following types of locations.

- Depot
- Fuel bunker
- HGV Service Station (motorway service area and strategic road network)

Current research indicates 70%-90% of refuelling takes place overnight at depots or destinations.[36]

Depot – Electric charging

Frequency of charging for a heavy goods vehicle will be dependent on its operation and will vary considerably with differing payloads and weather conditions. Research on how often HGVs need to charge is scarce due to the low operation of these vehicles in the real world. A report prepared by Ricardo on behalf of the Climate Change Committee in 2020 states daily refuelling to be rare but every two to three days being common dependent on the commodity.[37] The Battery Electric Truck Trial conducted by Cenex using a fleet of DAF 19 tonne trucks has so far identified most trucks use less than 50% of their charge daily.[38] The European Automobile Manufacturers' Association (ACEA)'s estimation of charging requirements suggests public charging will be required every fifth day for medium duty vehicles, every second day for heavy duty vehicles undertaking regional operations and daily for long haul heavy duty vehicles. This still assumes depot charging for all operations.

Government should conduct research with the logistics industry to understand the requirements, movement and volume of vehicles that are able to conduct their daily cycle with depot charging alone and those that will need to use the public charging network. This will help to determine a

[35] https://www.gov.uk/government/statistics/energy-consumption-in-the-uk-2021
[36] https://www.nationalgrid.com/document/146441/download
[37] https://www.theccc.org.uk/wp-content/uploads/2019/05/Zero-Emission-HGV-Infrastructure-Requirements-Ricardo-Energy-and-Environment.pdf
[38] https://bett.cenex.co.uk/

more accurate number of public chargepoints required for use by HGVs. Furthermore, the number of foreign-registered HGVs also needs to be taken into account to ensure the cleanest vehicles can be used in the UK to achieve the greatest environmental improvements.

All operators using a battery electric HGV will need to have some level of charging capacity at their depot and individual operators and use cases will determine how much is needed dependent on their operation. A study by Element Energy conducted on behalf of Transport and Environment states that between 65% and 75% of the rigid HGV fleet can be electrified using depot charging only with models already available on the market today.[39] This is based on a survey of 20 freight operators.

HGV charging adds no value to the business model of a haulier and any stopping time reduces the efficiency of the logistics operation, meaning an overall loss of revenue and potentially requiring more vehicles on the road to carry out the same business task as today. The road logistics sector works on low margins and purchasing decisions are made against a total cost of ownership (TCO) model, **therefore, charging and refuelling solutions must support efficient operations to mitigate any additional costs that may be passed on to the consumer**. Charging and refuelling a zero emission vehicle must be as easy as it currently is to refuel with diesel. The implementation of smart charging may open up opportunities for greater efficiencies and also allow vehicle to grid solutions whereby operators can use banks of vehicle batteries to power the premises.

Battery electric trucks have so far been in operation in the UK for urban logistics and municipal services such as refuse collection. This is reliant on a depot-based charging solution for low mileage use cases. **Depot charging will be required for all operators and should be facilitated as soon as possible**. Many depots are not owned by the operator of the vehicles, which makes the upgrades for energy provision complicated and often restrictive. The current fleet of zero emission HGVs in the UK is very small and serves mainly urban transportation and refuse collection services. With the absence of public charging and hydrogen refuelling sites suitable for use by HGVs it is assumed that 100% of charging takes place at the depot. The current challenges should not be underestimated and government should act quickly to resolve these if its net zero targets are to be met.

In our EV Infrastructure Position Paper, SMMT called for a universal 'right to charge' in the same way that consumers have a right to connect in the modern internet age. This right should extend to commercial premises with landlords required to support the provision of infrastructure by granting the

[39] https://www.element-energy.co.uk/wordpress/wp-content/uploads/2023/01/Phase-one-report-use-cases-that-don%e2%80%99t-require-public-charging.pdf

necessary consent. The depot may be considered similar to home charging for cars, with the exception that depots used for logistics operations will already have a diesel fuel supply.

The power requirements at the depot will be dependent on the number of vehicles and their actual use. Slow overnight charging can currently be undertaken with 22kW AC charging but it is expected that many operators will also benefit from 150kW+ charging capability to support a faster turnaround for the vehicle when necessary. Many tractor units will require at least a 40kW charge and therefore charging provision must be future-proofed to consider the type of vehicles an operator is using in line market development. The majority of depots in the UK have only one or two vehicles. These operators are unlikely to be carrying out major freight or distribution services and therefore they can continue to function with a 22kW chargepoint at the depot which in many cases is also a home. While each use case is unique, an upgrade to the electricity network may not always be required.

Freight operators carrying out urban deliveries going back to the depot on a daily basis can also achieve zero emission vehicle operations with charging infrastructure at the depot and little or no need for the use of public charging. Approximately one-third of road freight tonnes are for urban and regional deliveries.[40] With many cities aiming to improve air quality by implementing vehicle restrictions based on emissions, it is imperative that these operators are supported to be able to make the cleanest vehicle choices.

Operations that have consistent daily mileage and always return to base with low risk of detours or deviation to their operation such as refuse collection, for example, could operate without the need of any public charging or refuelling.

Locations of depots across the UK are widespread, but do exist in clusters around major cities and ports. The map below shows depot locations for operators with more than 50 HGVs. **The existing clustering of depots provides an opportunity for collaborations between operators to ensure sufficient energy is available for their fleet as they transition to zero emissions and also allow them to share charging facilities where appropriate.** This would reduce the overall energy provision required but it would need cooperation between operators for this to work effectively.

Currently, there are considerable barriers to installing charging infrastructure at depots. In many cases the depot may not be owned by the operator and therefore they will require permission from the landlord. The cost of upgrading the local grid to provide sufficient power for vehicle charging is often a prohibitive factor despite the imminent socialising of upgrade costs. Additional barriers include planning permission and obtaining wayleaves if cables are required to be laid through third-party land. The

[40] https://www.csrf.ac.uk/2020/07/white-paper-long-haul-freight-electrification/

changes implemented through the Ofgem Access and Forward-Looking Charges Significant Code Review[41] will reduce the cost burden for many operators – a welcome step towards supporting charging provision at depots. Additionally, there have been significant efforts made by distribution network operators (DNOs) to clarify and simplify the process of upgrading grid connections at depots for the provision of electric vehicle charging and we highlight UK Power Network's Optimise Prime project[42] as a good example of this. Despite this improved practice, the process of securing sufficient energy to enable fleet decarbonisation is inconsistent in both process and cost depending on location.

In 2021, the EV Energy Taskforce published its paper on commercial EV charging requirements,[43] which highlighted the barriers faced by fleet operators when installing charging infrastructure at depots. The most frequent challenges cited were grid capacity, cost of infrastructure and issues related to planning permission. To overcome these barriers, further regulatory support is required and **government should, through its review of the National Planning Policy Framework, simplify and create a nationally consistent process for installing charging and refuelling infrastructure at depots. Furthermore, a simplified, nationally consistent process for connection to the grid to enable depot-based charging should be created.**

[41] https://www.ofgem.gov.uk/sites/default/files/2022-05/Access%20SCR%20-%20Final%20Decision.pdf
[42] https://www.optimise-prime.com/
[43] https://www.zemo.org.uk/assets/reports/EV-Energy-Taskforce-Commercial-EV-Fleet-Charging-Requirements.pdf

FIGURE 4: DEPOTS WITH MORE THAN 50 HGVS

HTTPS://WWW.GOOGLE.COM/MAPS/D/U/0/VIEWER?MID=1CASLSYXR2UOBXDCT3CB8MWDJUVPXYUO&LL=54.75812982929611%2C0.00166560812334459 74&Z=7

Depot – Hydrogen refuelling

The use of hydrogen for energy has been seen for a long time as one of the solutions to meeting net zero targets. Manufacturers are bringing hydrogen HGVs to the market both in the UK and across the world. The provision of a hydrogen refuelling station (HRS) at depots would allow operations to continue in the same way as they currently do with diesel. Despite this significant advantage, the investment in hydrogen as a transport fuel remains low.

Many of the challenges faced by operators to install an HRS at the depot are much the same as those for electric vehicle charging in terms of landlord consent, planning permission and wayleaves but there are also additional challenges that need to be addressed in relation to the development of a robust hydrogen market and a future hydrogen transmission network, including purity, fugitive emissions (leaks) and safety. Understanding and addressing fugitive emissions and leakage is essential – a crucial part of a future infrastructure network for hydrogen distribution must include systems to effectively measure and prevent hydrogen fugitive emissions as much as possible.

In 2017, the UKH2 Mobility consortium identified two short-term barriers to investment in hydrogen refuelling stations (HRS) by private investors, they were the first mover disadvantage, and uncertainty over pace of FCEV rollout.[44] These barriers are still relevant today, although the uncertainty over FCEV rollout is arguably the most prominent. Concentrating demand can address both of these issues, for example, by focusing on local duty cycles which would provide a business case for refuelling. The report also identifies the individual investment model as the preferred option for HRS deployment, which has naturally become the default approach.

To focus and utilise investment efficiently, the UK government must work with the automotive industry (including leasing and hire companies) and the logistics industry to create a detailed map of opportunity areas for hydrogen refuelling infrastructure. This should include priority identification and future options for private and public networks in the form of a hydrogen infrastructure strategy, with plans for installation and a view to graduated expansion over time.

The costs of installing hydrogen refuelling at a depot are significant and can extend to millions of pounds. **Considerable investment is needed to support this for the long haul freight sector in particular** where vehicles travel into Europe and Ireland. Many of these vehicles will be double shifted and only stop for their scheduled service, therefore, a battery electric solution will not yet be sufficient due to the long ranges driven without planned stopping for lengthy periods of time.

[44] http://www.ukh2mobility.co.uk/wp-content/uploads/2017/09/Communication_pack_January_2017.pdf

The use of bunkered fuel locations for hydrogen refuelling may reduce some of the costs of installing infrastructure at depots and these can be shared by multiple operators.

Public Charging

The current public charging network for electric cars in the UK is not suitable for HGVs due to their differing technical specifications and higher power demand. Additionally, public charging has been designed to support the passenger car parc and therefore the parking spaces can rarely accommodate larger vehicles.

In 2021, the European Automobile Manufacturers' Association (ACEA) published its position paper on charging and refuelling infrastructure for HDVs.[45] It specified an installation target of 10,000-15,000 (higher-power) public and destination charging points by no later than 2025, and 40,000-50,000 charging points no later than 2030 in the EU27 countries plus the UK. The UK target is 2,450 chargepoints in 2025 and 8,200 chargepoints in 2030 at 3,000 locations. The location study acknowledges an over-representation of locations in the UK and does not take into account accessibility or suitability of the sites. **Government should conduct research in partnership with the freight sector to understand the requirements, movement and volume of vehicles that are able to conduct their daily cycle without charge and those who will need to use a public charging network**.

Further research is required to understand HGV movements across the UK and determine the number of public chargepoints required. We can establish the number and type of locations that should be included in the charging and refuelling network and while this is lower than ACEA's estimate of 3,000, the number of chargepoints suggested is appropriate until further research can determine otherwise.

While many operators will only re-fuel at the depot, refuelling can also take place at a fuel bunkering site, which is a location where an operator is able to purchase fuel in bulk and dispense it themselves. Alternatively, operators may use an HGV service station. There are approximately 1,000 bunkered fuel sites across the UK[46] with hotspot areas around the South-East, Midlands and North-East regions. A bunkered fuel site allows the use of a fuel card and, therefore, the cost of the fuel is likely to be cheaper than at an HGV service station.

Frequency of refuelling varies greatly dependent on the use case, whether this is for urban and regional delivery or long haul delivery. It is anticipated that all vehicles will charge or refuel at the depot and

[45] https://www.acea.auto/files/ACEA_Position_Paper-Heavy-duty_vehicles-Charging_and_refuelling_infrastructure.pdf
[46] https://www.erouteonline.com/v7/ukfuels/#

long haul trucks will need to refuel en-route at motorway and trunk road service areas or fuel bunker sites also.

Driver regulations require that a 45-minute break must be taken after every four and a half hours of driving. This time is to be used for resting and not for refuelling which is considered to be a work practice. With the range available from a diesel truck, refuelling is not as frequent as electric charging is expected to be. To allow drivers to carry out freight functions in the most efficient manner, a system of pre-booking parking spaces with charging capability should be deployed. Operators choosing to use hydrogen will be able to continue their operations in the same way as with diesel, provided there are enough hydrogen refuelling stations in place.

HGVs operate with diverse daily drive cycles and have different refuelling patterns to those of vans and passenger cars. They are also naturally larger and longer vehicles (especially when coupled to a trailer), meaning they need additional access and turning requirements only found in larger sites. HGVs do not always visit motorway services, with many common truck stops being A-road laybys, or on private land around business depots. This naturally limits the scope for recharging an electric truck when on regional or long-haul deliveries. A survey of truck parking conducted in 2021 by Aecom on behalf of DfT highlighted a shortage of parking spaces.[47] The study focused on rest stops within 5km of the Strategic Road Network (SRN) and found a shortfall of 5,000 spaces. **This demonstrates that providing charging and refuelling infrastructure alone may not be enough and further support is required to improve parking provision for HGVs across the UK**.

The trans-European transport network (TEN-T) comprises multi modal network corridors for the efficient transport of people, goods and services. In its position paper on CO_2 standards for heavy duty vehicles,[48] the European Association of Automotive Suppliers (CLEPA) specifies that to meet CO_2 targets there must be charging points installed every 50km on the Ten-T Core network and every 100km on the Ten-T comprehensive. UK government guidance, *The Strategic Road Network and the Delivery of Sustainable development*[49] sets out standards for motorway service areas including the number of parking spaces required for HGVs and that provision must be made for zero emission and hybrid vehicles (including HGVs, vans and coaches). The guidance also states the maximum distance between service areas should be 28 miles (45km) or the equivalent of 30 minutes of driving. Providing charging infrastructure for HGVs at each motorway service area on the SRN will fulfil the recommendation specified by CLEPA.

[47] https://www.gov.uk/government/publications/national-survey-of-lorry-parking-part-one-2022
[48] https://clepa.eu/wp-content/uploads/2022/07/2022-07-CO2-standards-HDV.pdf
[49] https://www.gov.uk/government/publications/strategic-road-network-and-the-delivery-of-sustainable-development/strategic-road-network-and-the-delivery-of-sustainable-development#annex-a-roadside-facilities-tables

SMMT welcomes the UK government's commitment of £950 million in its Rapid Charging Fund, which seeks to provide energy for electric vehicle charging infrastructure at motorway service areas and along the SRN. However, this is currently is focussed on car and van infrastructure. **An expansion of and increase in investment to supplement Project Rapid should be provided now to ensure the charging and refuelling requirements of trucks (as well as buses and coaches) are also provided for**. Providing charging infrastructure at motorway and trunk road service areas along the SRN would create 114 locations where HGVs can charge, catering for operators of regional and long-haul distribution. It is assumed that vehicles will take short stops in these locations for a comfort break and to re-fuel and, therefore, a rapid charging solution will be needed.

From June 2021 to June 2022, 76% (90 million tonnes) of inter-modal journeys began or ended at a port.[50] UK ports remain key areas of HGV freight movement and should be considered part of any HGV charging strategy. There are 139 ports in the UK authorised for international and domestic movement of freight,[51] however, 10 major shipping ports in the UK account for around 68% of all cargo. These already have truck rest stops in close proximity so charging at the port itself will not be necessary.

Ports across the UK have varying functions and each case should be considered dependent on their commercial model as to whether charging at that location is necessary or whether nearby provision will be sufficient. The maritime sector has its own obligation to meet net zero emissions. Government is supporting these through the UK Shipping Office for Reducing Emission (UK SHORE) and includes an innovation fund of £77 million for clean maritime solutions. There is an opportunity within this workstream to collaborate with the transport sector to ensure the energy provided for shoreside charging of vessels can also support vehicles.

Additionally, 23% (27 million tonnes) of inter-modal journeys began or ended at a railway siding. DfT's Freight Energy Forum has committed to the development of an HGV infrastructure strategy that looks at the whole freight sector. This is a welcome step and can create efficiencies through cross sector working.

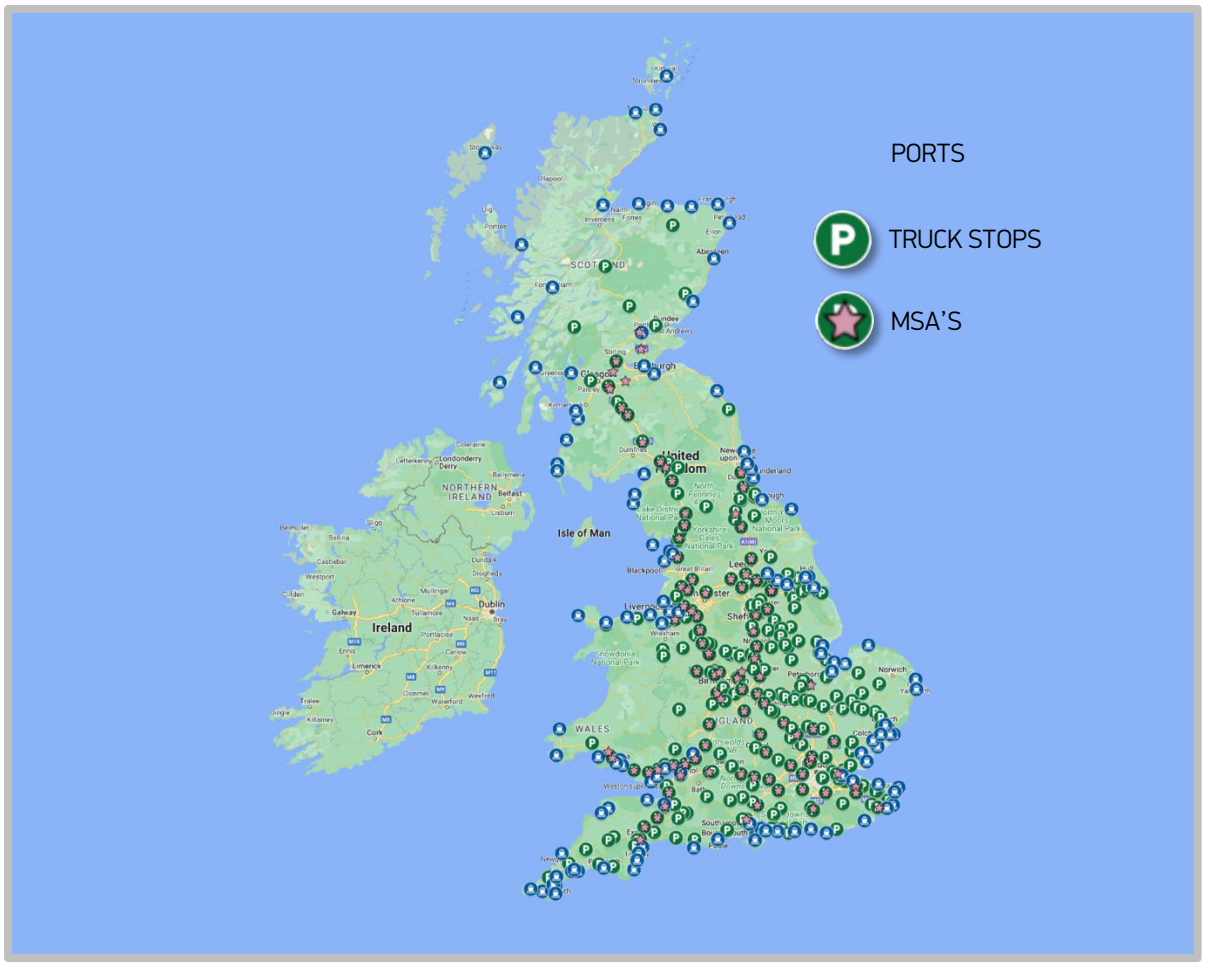
Government must identify and support cross-sector opportunities for decarbonisation of transport.

[50] https://www.gov.uk/government/statistics/domestic-road-freight-statistics-july-2021-to-june-2022/domestic-road-freight-statistics-july-2021-to-june-2022
[51] https://www.gov.uk/government/statistical-data-sets/port-and-domestic-waterborne-freight-statistics-port

Providing battery electric charging on the SRN, truck rest stops and at or near ports and railways will create a comprehensive network across the UK to support the decarbonisation of HGVs as well as coaches.

FIGURE 5: MAP OF UK MSA'S, TRUCK REST STOPS AND PORTS

HTTPS://WWW.GOOGLE.COM/MAPS/D/U/0/VIEWER?MID=1CASLSYXR2UOBXDCT3CB8MWDJUV[illegible]&LL=54.758129829296 11%2C0.00166560812334459 74&Z=7



Public hydrogen refuelling

Due to the significant costs associated with the production and distribution of hydrogen, it is expected that the majority of hydrogen refuelling will take place at public or shared locations. The UK has gone backwards when it comes to actual deployment of hydrogen refuelling infrastructure, with fewer stations now than in 2019.

The UK government must work with the automotive industry (including leasing and hire companies) and the logistics industry to create a detailed map of opportunity areas for hydrogen refuelling infrastructure, including priority and future options for private and public networks in the form of a hydrogen infrastructure strategy, with plans for installing and a view to graduated expansion over time.

Options for hydrogen technology exist within a fuel cell or in a combustion engine. With the development of zero emission technologies for the long haul sector still developing, the use of hydrogen as a combustion fuel will support emissions reductions sooner than the current trajectory is allowing for.

Given that vehicles, and more specifically long distance HGV freight, often travel through multiple countries right across Europe, we need to make sure that we work with European partners to ensure interoperability of hydrogen infrastructure standards, ensuring smooth operations across borders for consumers. CLEPA has stated hydrogen refuelling should be available at every 100km along the Ten-T Core network.[52] This level of provision in the UK would be sufficient if it was at every other motorway service area and also at truck rest stops.

[52] https://clepa.eu/wp-content/uploads/2022/07/2022-07-CO2-standards-HDV.pdf

5: ALTERNATIVE CHARGING METHODS

Electric Road Systems

An Electric Road System (ERS) is a network of overhead cables that provide energy through a pantograph otherwise known as catenary charging. The use of ERS is currently small scale but feasibility studies are being carried out for operation in the UK. A vehicle using an ERS will still need static battery charging at the depot or other charging station but by being able to charge while driving via the ERS allows vehicles with smaller batteries to operate on long journeys and also prevents the need for stopping to charge, therefore, securing the efficiency of freight operations. Additionally, smaller batteries will reduce the cost of the vehicle but the cost of installing the infrastructure along the motorway network will need to be accounted for.

An ERS may be an attractive proposition for the long haul sector as, provided the infrastructure is installed in sufficient quantity and in the right locations, it can provide unlimited range. Siemens' dynamic charging network has been trialled in Germany and now also here in the UK as part of the Zero Emission Road Freight Demonstrator (ZERFD) programme.[53] The Centre for Sustainable Road Freight (CSRF) in its white paper on long haul freight electrification states that an investment of £19.3 billion would be required to electrify almost all of the UK's long haul freight vehicles, which equals 65% of road freight movements.[54]

While the technology for an ERS is well established and proven, rollout of the infrastructure in line with compatible vehicles may take much longer. It is anticipated that, provided work starts now, a network large enough to support decarbonisation of the HGV sector to meet climate goals could be in place by 2030.

There remain many challenges to this method of charging, including the feasibility and acceptability of the infrastructure along the strategic road network. ERS alone will not be sufficient for all HGV charging needs and the provision of static and depot charging would still be necessary.

[53] https://iuk.ktn-uk.org/opportunities/zero-emission-road-freight-demonstrations-2022/
[54] https://www.csrf.ac.uk/2020/07/white-paper-long-haul-freight-electrification/

Inductive charging

Inductive charging (IC) also is an established technology used in various applications such as mobile phones and has the potential to complement the mix of charging solutions for many use cases. IC works when an electric current is sent through an electric coil creating a magnetic field thus generating another current in a second coil some distance away.[55] There are two options for inductive charging for HGVs, static and dynamic. A static IC system can be used at the depot and also in public when the vehicle is idle such as a loading bay. The dynamic IC system allows a charge to take place while the vehicle is in motion along the highway.

There are a number of IC trials taking place in the UK for smaller vehicles, including a project in the Midlands by Connecter Kerb[56] and by Sprint Power for taxis in Nottingham.[57] For HDVs, trials have taken place for buses in London.[58]

Inductive charging for HGVs is very much a development in its infancy and a case that still has to be proven in the UK. Potential for low level inductive charging at destinations could possibly be a first step towards a wider introduction of this technology.

[55] https://www.renaultgroup.com/en/news-on-air/news/how-does-induction-charging-work/#:~:text=When%20an%20electric%20current%20is,to%20another%20without%20physical%20contact.
[56] https://www.current-news.co.uk/connected-kerb-announce-wireless-ev-charger-rollout
[57] https://www.current-news.co.uk/sprint-power-develops-wireless-charging-for-electric-taxi-trial/
[58] https://www.current-news.co.uk/london-buses-to-test-wireless-electric-chargers/

6: CONCLUSION

Vehicle manufacturers are already introducing new products with battery and hydrogen technology to a slowly growing zero emission HGV market. However, the absence of a public charging and refuelling network for HGVs is undermining the efforts to bring longer haul vehicles to the UK market. While depot-based infrastructure will be the priority source of charging and refuelling, a public network is essential to support longer journeys and also foreign registered vehicles traversing the UK.

The choice between battery electric and hydrogen will be largely dependent on the use case, however, the development of public charging and refuelling should be done in parallel along the SRN.

We have seen positive development of the zero emission car, LCV and bus markets through the provision of vehicle incentives, infrastructure deployment and supporting enablers such as benefit in kind and zero emission bus funding which includes provisions for infrastructure. Such support is not available for the HGV and coach sectors so we see these markets trailing some significant distance behind the desired goal to achieve net zero ambitions.

The challenges to decarbonise the HGV sector in such a short space of time must not be underestimated and for this reason it is imperative that government acts swiftly to convene collaboration between all stakeholders involved in the journey as well as providing support to secure the infrastructure and associated energy supply.

The current network of depots, MSAs and truck rest stops provide for an adequate spread of charging and refuelling opportunities. Further data is required to determine how much charging and refuelling capacity is required at each location.

TABLE 7: APPROXIMATE NUMBER OF CHARGING LOCATIONS

LOCATION	NUMBER	MINIMUM REQUIREMENT
Depots	66,973	22kW to 500kW
Truck rest stops	329	50kW to 1MW
MSAs and TRSAs	114	350kW to 1MW and H2 350/700bar
Bunkered fuel sites	1000	H2 350/700 bar
Ports	139	350kW to 1MW

N.B. some truck rest stops are located at an MSA and should be counted as one location.

SMMT considers the hierarchy for HGV infrastructure to be as follows:

- Depot charging and refuelling
- MSAs/TRSAs
- Truck rest stops
- Intermodal locations (ports, railway sidings)

TO DELIVER THESE RECOMMENDATIONS:

The government's Freight Energy Forum should deliver a long term infrastructure strategy to meet the commitment by the UK government to phase out the sale of new non-zero emission HGVs by 2035/40, in partnership with the automotive and logistics industries and other policy stakeholders. This should ensure UK-wide consistent policies at both local and national level.